IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1.   (Cancel)

2.   (Currently Amended) The illumination system of claim [[1]] 12. wherein the beam shaping optical system comprises a plurality of masking apertures.

3.   (Previously Presented)   The illumination system of claim 2, wherein at least one of the masking apertures comprises an opaque plate with one or more apertures.

4.   (Previously Presented)   The illumination system of claim 3, wherein at least one of the masking apertures comprises a translucent plate with a central obscuration.

5.   (Previously Presented)   The illumination system of claim 4, wherein the central obscuration is circular or square.

6.   (Currently Amended) The illumination system of claim [[1]] 12, further comprising an optical integrator arranged on a light exit side of said beam shaping optical system.

7.   (Previously Presented)   The illumination system of claim 6, further comprising a square shaped aperture arranged between said beam shaping optical system and said optical integrator.

8.   (Currently Amended) The illumination system of claim [[1]] 12, wherein the beam shaping optical system is constructed to produce a shaped illumination pattern that has a shape selected from the group consisting of round, square, and elliptical shapes.

9.   (Previously Presented)   The illumination system of claim 8, wherein the beam shaping optical system comprises a diffractive optical element.

10.   (Previously Presented)   The illumination system of claim 8, wherein the beam shaping optical system comprises a beam splitter located between the source of light and an exit pupil of said illumination system.

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11.   (Currently Amended) The illumination system of claim [[1]] 12, further comprising a relay optical system arranged between said light source and an exit pupil of said illumination system.

12.   (Previously Presented) An illumination system comprising:

a light source; and

a beam shaping optical system arranged in an optical path from said light source;

wherein said beam shaping optical system comprises a masking aperture comprising:

a translucent substrate;

a half-tone dithered pattern on the substrate, said half-tone dithered pattern comprising an array of pixels, each pixel of a clear or opaque type and of the same size, said clear and opaque pixels for respectively passing and blocking incident light, wherein the number, size, and type of the pixels are chosen in accordance with:

(a) the wavelength of light used to illuminate the photomask, and

(b) the size and shape of the features of the photomask.

13.   (Currently Amended) The illumination system of claim 12, wherein the half-tone dithered pattern comprises an array of diffraction elements and each diffraction element is a ~~dither~~ dithered pattern of clear or opaque pixels.

14.   (Previously Presented)   The illumination system of claim 12, further comprising

an optical integrator arranged in an optical path from said beam shaping optical system; and

a square-shaped aperture disposed between said optical integrator and said beam shaping optical system.

15.   (Original)   The illumination system of claim 13, wherein each diffraction element pixel comprises an $n \times n$ dithered matrix of pixels, the intensity of each element is

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defined by the number and type of pixels in its dithered matrix and wherein the pixels in each matrix are dithered to avoid artifacts.

16.   (Previously Presented)   The illumination system of claim 13, wherein the relative intensity of each subpixel is defined by a recursion relationship where:

$$D^n = \begin{vmatrix} 4D^{n/2} + D_{00}^2 U^{n/2} & 4D^{n/2} + D_{01}^2 U^{n/2} \\ 4D^{n/2} + D_{10}^2 U^{n/2} & 4D^{n/2} + D_{11}^2 U^{n/2} \end{vmatrix}$$

and

$$U^n = \begin{vmatrix} 1 & 1 & \dots & 1 \\ 1 & & & \\ \cdot & & & \\ \cdot & & & \\ \cdot & & & \\ 1 & & & \end{vmatrix}.$$

17.   (Previously Presented)   The illumination system of claim 16, wherein the matrix of pixels comprises an 8 x 8 matrix and the relative intensity, D^8, comprises :

$$D^8 = \begin{vmatrix} 0 & 32 & 8 & 40 & 2 & 34 & 10 & 42 \\ 48 & 16 & 56 & 24 & 50 & 18 & 58 & 26 \\ 12 & 44 & 4 & 36 & 14 & 46 & 6 & 38 \\ 60 & 28 & 52 & 20 & 62 & 30 & 54 & 22 \\ 3 & 35 & 11 & 43 & 1 & 33 & 9 & 41 \\ 51 & 19 & 59 & 27 & 49 & 17 & 57 & 25 \\ 15 & 47 & 7 & 39 & 13 & 45 & 5 & 37 \\ 63 & 31 & 55 & 23 & 61 & 29 & 53 & 21 \end{vmatrix}.$$

18.   (Previously Presented) The illumination system of claim 6, wherein the optical integrator is a fly's eye array of lenslets.

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24. (Currently Amended) The lithographic apparatus of claim [[23]] 34, wherein the beam shaping optical system comprises a plurality of masking apertures.

25. (Previously Presented) The lithographic apparatus of claim 24, wherein at least one of the masking apertures comprises an opaque plate with one or more apertures.

26. (Previously Presented) The lithographic apparatus of claim 25, wherein at least one of the masking apertures comprises a translucent plate with a central obscuration.

27. (Previously Presented) The lithographic apparatus of claim 26, wherein the central obscuration is circular or square.

28. (Currently Amended) The lithographic apparatus of claim [[23]] 34, wherein said illumination system further comprises an optical integrator arranged on a light exit side of said beam shaping optical system.

29. (Previously Presented) The lithographic apparatus of claim 28, wherein said illumination system further comprises a square shaped aperture arranged between said beam shaping optical system and said optical integrator.

30. (Currently Amended) The lithographic apparatus of claim [[23]] 34, wherein the beam shaping optical system is constructed to produce a shaped illumination pattern that has a shape selected from the group consisting of round, square, and elliptical shapes.

31. (Previously Presented) The lithographic apparatus of claim 30, wherein the beam shaping optical system comprises a diffractive optical element.

32. (Previously Presented) The lithographic apparatus of claim 30, wherein the beam shaping optical system comprises a beam splitter located between the source of light and an exit pupil of said illumination system.

33.   (Currently Amended) [[The]] A lithographic apparatus, of claim [[23]] 34, further comprising a relay optical system arranged between said light source and an exit pupil of said illumination system.

34.   (Currently Amended) [[The]] A lithographic apparatus [[of claim 23]] comprising,

an illumination system arranged to illuminate a mask; and

a projection optical system arranged to project radiation from said mask onto a substrate,

wherein said illumination system comprises a beam shaping optical system having a masking aperture comprising:

a translucent substrate, and

a half-tone dithered pattern on the substrate,

wherein said half-tone dithered pattern on said substrate comprises an array of pixels, each pixel being a clear or opaque type and of the same size, said clear and opaque pixels being for passing and blocking respectively incident light, wherein the number, size, and type of the pixels are chosen in accordance with:

(a) the wavelength of light used to illuminate the photomask, and

(b) the size and shape of the features of the photomask.

35.   (Previously Presented)   The lithographic apparatus of claim 34, wherein the half-tone dithered pattern comprises an array of diffraction elements and each diffraction element is a dithered pattern of clear or opaque pixels.

36. (Previously Presented) The lithographic apparatus of claim 34, wherein said illumination system further comprises:

an optical integrator arranged in an optical path from said beam shaping optical system; and

a square-shaped aperture disposed between said optical integrator and said beam shaping optical system.

37. (Previously Presented) The lithographic apparatus of claim 36, wherein each diffraction element pixel comprises an n x n dithered matrix of pixels, the intensity of each element is defined by the number and type of pixels in its dithered matrix and wherein the pixels in each matrix are dithered to avoid artifacts.

38. (Previously Presented) The lithographic apparatus of claim 36, wherein the relative intensity of each subpixel is defined by a recursion relationship where:

$$D^n = \begin{vmatrix} 4D^{n/2} + D_{00}^2 U^{n/2} & 4D^{n/2} + D_{01}^2 U^{n/2} \\ 4D^{n/2} + D_{10}^2 U^{n/2} & 4D^{n/2} + D_{11}^2 U^{n/2} \end{vmatrix}$$

and

$$U^n = \begin{vmatrix} 1 & 1 & \dots & 1 \\ 1 & & & \\ \cdot & & & \\ \cdot & & & \\ \cdot & & & \\ 1 & & & \end{vmatrix}.$$

39. (Previously Presented) The lithographic apparatus of claim 38, wherein the matrix of pixels comprises an 8 x 8 matrix and the relative intensity, D^8, comprises :

$$D^8 = \begin{vmatrix} 0 & 32 & 8 & 40 & 2 & 34 & 10 & 42 \\ 48 & 16 & 56 & 24 & 50 & 18 & 58 & 26 \\ 12 & 44 & 4 & 36 & 14 & 46 & 6 & 38 \\ 60 & 28 & 52 & 20 & 62 & 30 & 54 & 22 \\ 3 & 35 & 11 & 43 & 1 & 33 & 9 & 41 \\ 51 & 19 & 59 & 27 & 49 & 17 & 57 & 25 \\ 15 & 47 & 7 & 39 & 13 & 45 & 5 & 37 \\ 63 & 31 & 55 & 23 & 61 & 29 & 53 & 21 \end{vmatrix}$$

40. (Previously Presented) The lithographic apparatus of claim 28, wherein the optical integrator is a fly's eye array of lenslets.